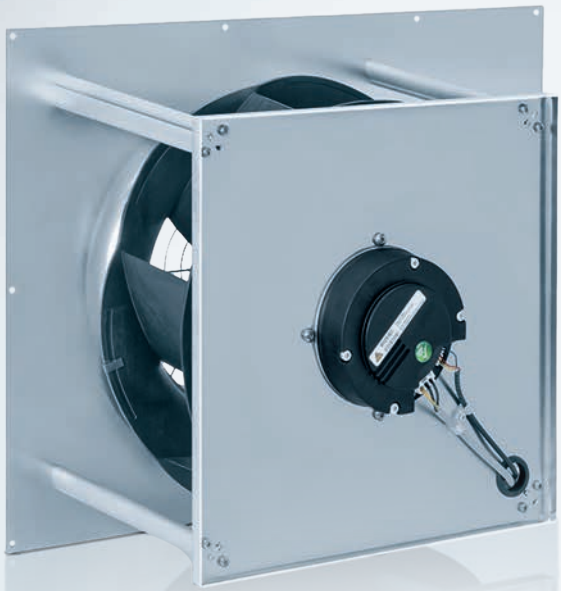
Cleanroom

Networked EC-Fans for
filter-fan-units.

ebmpapst

engineering a better life



About ebm-papst.

ebm-papst is a leader in ventilation and drive engineering technology and a much sought-after engineering partner in many industries. With around 20,000 different products, we have the perfect solution for practically every requirement. We have placed the highest emphasis on economy and ecology for many years.

We believe the consistent further development of our highly-efficient GreenTech EC technology provides our customers with the best opportunities for the future in industrial digitization. With GreenIntelligence, ebm-papst already offers intelligent networked complete solutions that are unique anywhere in the world today and that secure our customers a decisive advantage.

ebmpapst

engineering a better life

Six reasons that make us the ideal partner:

Our systems expertise.
You want the best solution for every project. The entire ventilation system must thus be considered as a whole. And that's what we do – with **motor technology** that sets standards, sophisticated **electronics** and **aerodynamic** designs – all from a single source and perfectly matched.

Our spirit of invention.
We are also always able to develop customized solutions for you with our versatile team of over 600 engineers and technicians.

Our lead in technology.
We are not only pioneers and trailblazers in the development of highly efficient EC technology, we also recognized the opportunities of digitization at an early stage. Therefore, we can offer solutions today that combine the highest energy efficiency with the advantages of IoT and digital networking.

Closeness to our customers.
ebm-papst has 25 production locations worldwide (including facilities in Germany, China and the USA), together with 49 sales offices, each of which has a dense network of sales representatives. You will always have a local contact, someone who speaks your language and knows your market.

Our standard of quality.
Our quality management is uncompromising, at every step in every process. This is underscored by our certification according to international standards including DIN EN ISO 9001, TS declaration of conformity and DIN EN ISO 14001.

Our sustainable approach.
Assuming responsibility for the environment, for our employees and for society is an integral part of our corporate philosophy. We develop products with an eye to maximum environmental compatibility, in particular resource-preserving production methods. We promote environmental awareness among our young staff and are actively involved in sports, culture and education. That's what makes us a leading company – and an ideal partner for you.

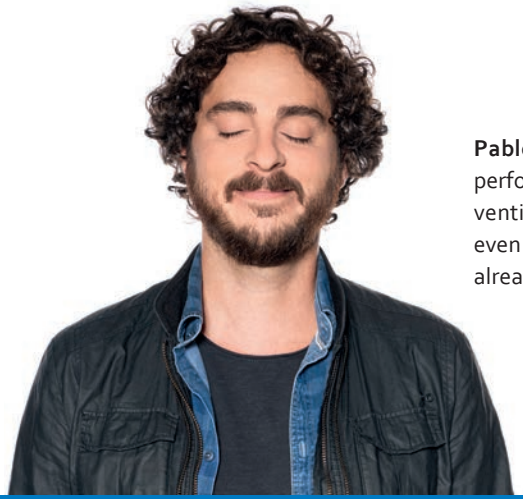
GreenIntelligence.
Making Engineers Happy.

Why do our customers look so happy? Because when it comes to the Internet of Things and the digital transformation, we provide them with a clear competitive edge with GreenIntelligence for intelligent control and interconnection of fans, drives and systems to make applications more powerful, processes more efficient, businesses more successful and their customers more satisfied.

or **industrial ventilation technology**, solutions are in demand that ensure top performance and operational reliability in every situation. GreenIntelligence gives you robust fan solutions with intelligent networking capabilities that provide reliable performance data and extensive control and monitoring functions. They ensure high levels of efficiency and system availability.

Here is how much GreenIntelligence there is in filter-fan-units (FFU):

- Expanded functionality for auto-addressing, allowing easier installation
- Simple system monitoring via MODBUS interface
- All the necessary hardware and software components from a single supplier
- Predictive maintenance: Status monitoring for fan and FFU



Pablo improves the performance of his ventilation systems even when they are already in operation.

Contents

Clean air *like in the mountains – thanks to filter-fan-units.*

The requirements are stringent.

Special rooms come with special demands. In cleanroom operation, this means clean air with a high air exchange rate, sufficient pressure, exact temperature and humidity control, and air quality that is always consistent. High-performance ventilation systems are required to achieve all that. ebm-papst has developed special fans for filter-fan-units (FFU) for cleanroom ceilings. These units made up of filter technology and fan ensure the required recirculating air mode. They also prevent contamination in the air and damage or impairments when producing sensitive products. In addition, ebm-papst FFUs are extremely quiet, satisfying the strict noise protection conditions for production in cleanrooms.

EC centrifugal fans – the heart of filter-fan-units.
Fans play an important role in cleanroom technology. ebm-papst EC centrifugal fans for filter-fan-units are specially designed for this area of application. They not only supply the air volumes common for the different FFU sizes (580, 1,170 and 2,330 m³/h) with sufficient pressure reserves, but also have an efficiency of over 55 % thanks to GreenTech EC technology and RadiCal impellers. This means they consume 10 % less power than the current industry standard. They are also 6 to 7 dB quieter than the conventional standard.

Compact but easy to maintain.
Filter-fan-units are installed in cleanrooms in large numbers and at uniform distances as part of the ceiling system. Uniform ventilation of the space is ensured by the air being delivered over a large area. However, the installation conditions also require low installation depths. Thanks to their compact design with an external rotor motor, EC centrifugal fans for FFUs only have an installation depth of 190 to 275 mm with diameters of 250, 310 or 400 mm. The devices can be controlled using an analog 0–10 V signal or a digital RS485 interface.

One system. Two air flow principles.

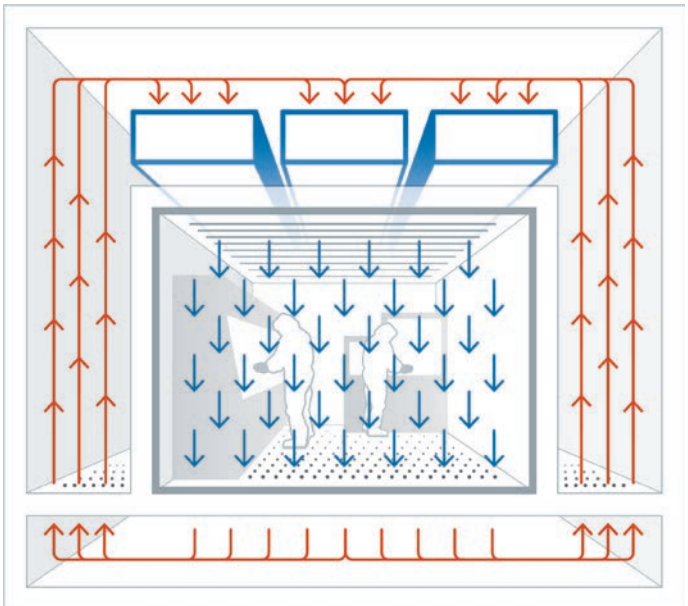
Every cleanroom is supplied with fresh, clean air via the filter-fan ceiling system. But the air flow can be generated in two different ways. The right air flow largely depends on how the cleanroom is being used.

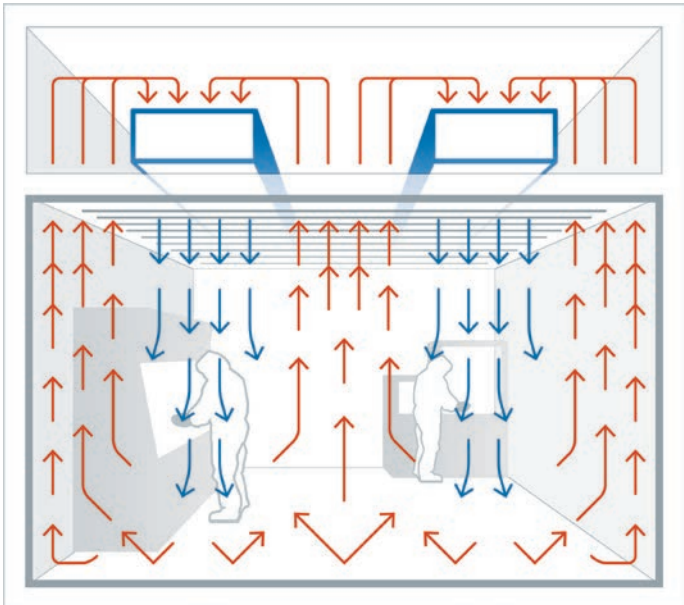
Low-turbulence laminar flow
Defined as "unidirectional air flow, regulated air flow at a uniform speed across the entire cross-section of a cleanroom or clean area, which is seen as parallel air flow." (DIN EN ISO 14644-1:2016-06)

This principle is generally referred to as "laminar flow" and requires a low-turbulence inflow. The air escapes here through ground-level outlets, e.g. via a perforated double floor. From there, it is returned to the recirculation unit, where it is filtered again. Low-turbulence laminar flow is particularly suitable for sensitive operating ranges.

Turbulent flow
Defined as "(an) air flow that is not running in one direction. Air distribution in which primary air entering the cleanroom or clean area is mixed with the interior air by induction." (ISO 14644-1:2016-06)

As a result, filtered clean air is introduced into the cleanroom in a swirl and rapidly dilutes the concentration of particles. Here, the room air flows through the cleanroom ceiling to the recirculation unit. With this flow principle, it is particularly crucial that the staff behave in a way that is suitable for the cleanroom to guarantee that the air particles have the required purity class.





Top performance *in every detail.*

HIGH-PERFORMANCE IMPELLER

High efficiency
– Aerodynamically optimized
– Profiled blade geometry for maximum efficiency

Quiet operation
– 6 to 7 dB lower noise emissions than the industry standard

Optimum materials
– High-performance impeller made of resistant plastic composite material
– Compatible with cleanrooms
– Fire class HB or 5 VA as per UL94
– Alternatively with aluminum impeller

Fraunhofer IPA TESTED® DEVICE
ebm-papst Mulfingen
Impeller Radical PPGF40
Report No. EB 1703-895

CONNECTOR BOARD

Easy to connect
– 2 x RJ45 network socket, use of CAT5 network cables possible
– Power supply via Wieland GST 18/3 plug system
– Version with and without built-in mains switch

Quick information
– 2 x LEDs for status signaling

GREENTECH EC MOTOR

High efficiency
– High energy efficiency and low thermal load

Unbeatably compact
– Impeller mounted directly on rotor

Soft commutation
– Patented process for quiet and efficient operation
– High, acoustically imperceptible cycle frequency

Long service life
– Brushless commutation
– Insulated bearing system to prevent bearing currents
– Maintenance-free bearings
– Bearing service life L_{10h} > 100,000 h thanks to the motor being well cooled in the air flow and low motor heating at T_u 23°C and nominal air quantity of the FFU

Can be used all over the world
– Wide voltage input with active PFC

FAN INSTALLATION MODULE

Easy to fit
– Ready-to-connect systems that are tested at the factory:
  – EC centrifugal impeller with cable and connector board
  or
  – Fully assembled fan installation module incl. nozzle plate, motor support plate, 4 profile struts and guard grill as shown in illustration

MODBUS-RTU *and 0–10 V analog input.*

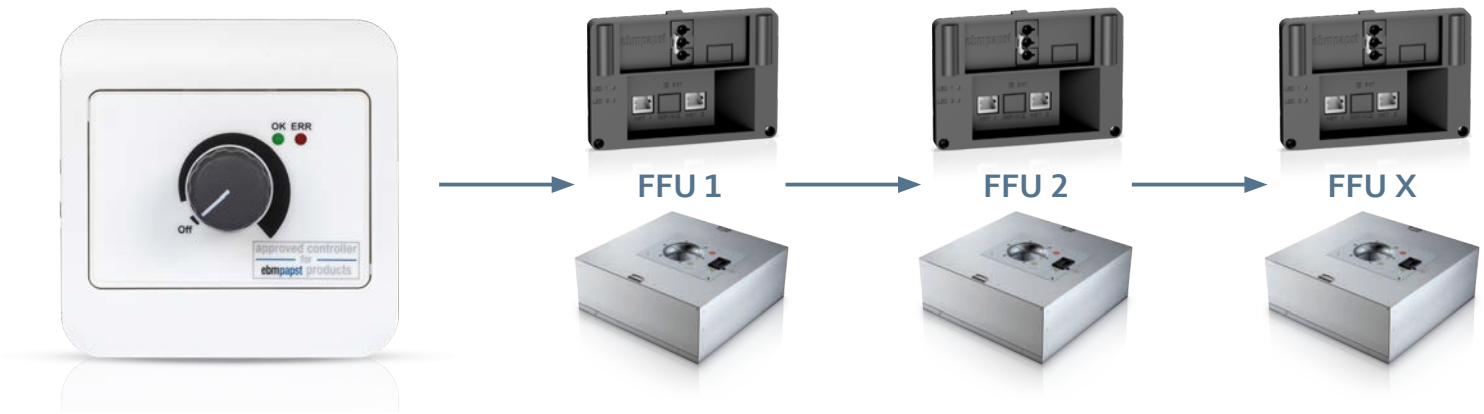
What type of connection would you like?
Whether analog or digital, our various interfaces make every connection easy, safe and fast. What version would you like?

For fan units with MODBUS/0–10 V, the set value source can be changed from 0–10 V (factory setting) to MODBUS RTU.

This series can be controlled with both a (analog) 0–10 V signal and MODBUS (digital).

- Speed control with potentiometer or optional 0–10 V source, e.g. laminar flow controller.
- Remote querying of any 0–10 V sensor (e.g. pressure) connected to the analog 0–10 V input of the fan.
- Speed setting using any MODBUS RTU master.

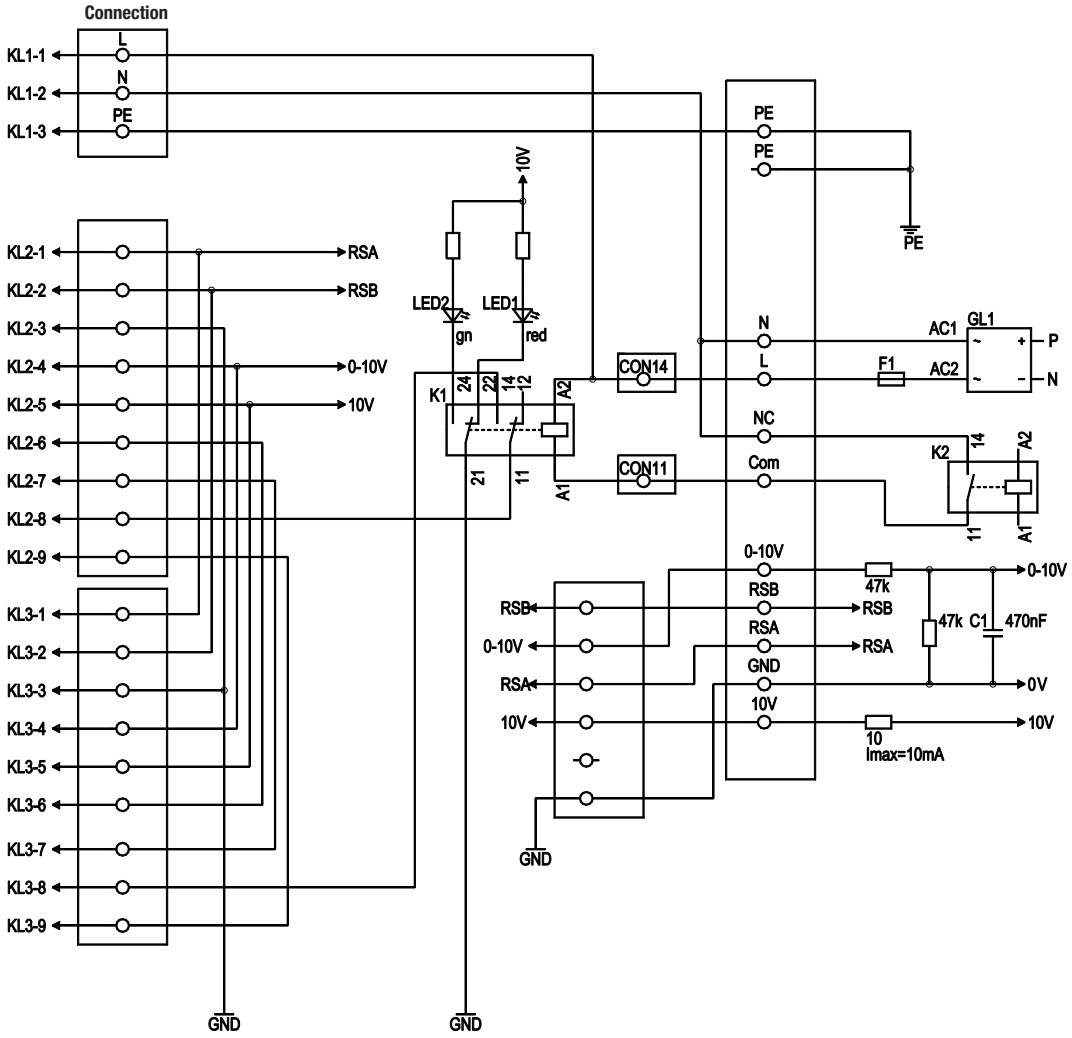
Potentiometer



0–10 V controller

MODBUS controller

Diagram



Connection diagram

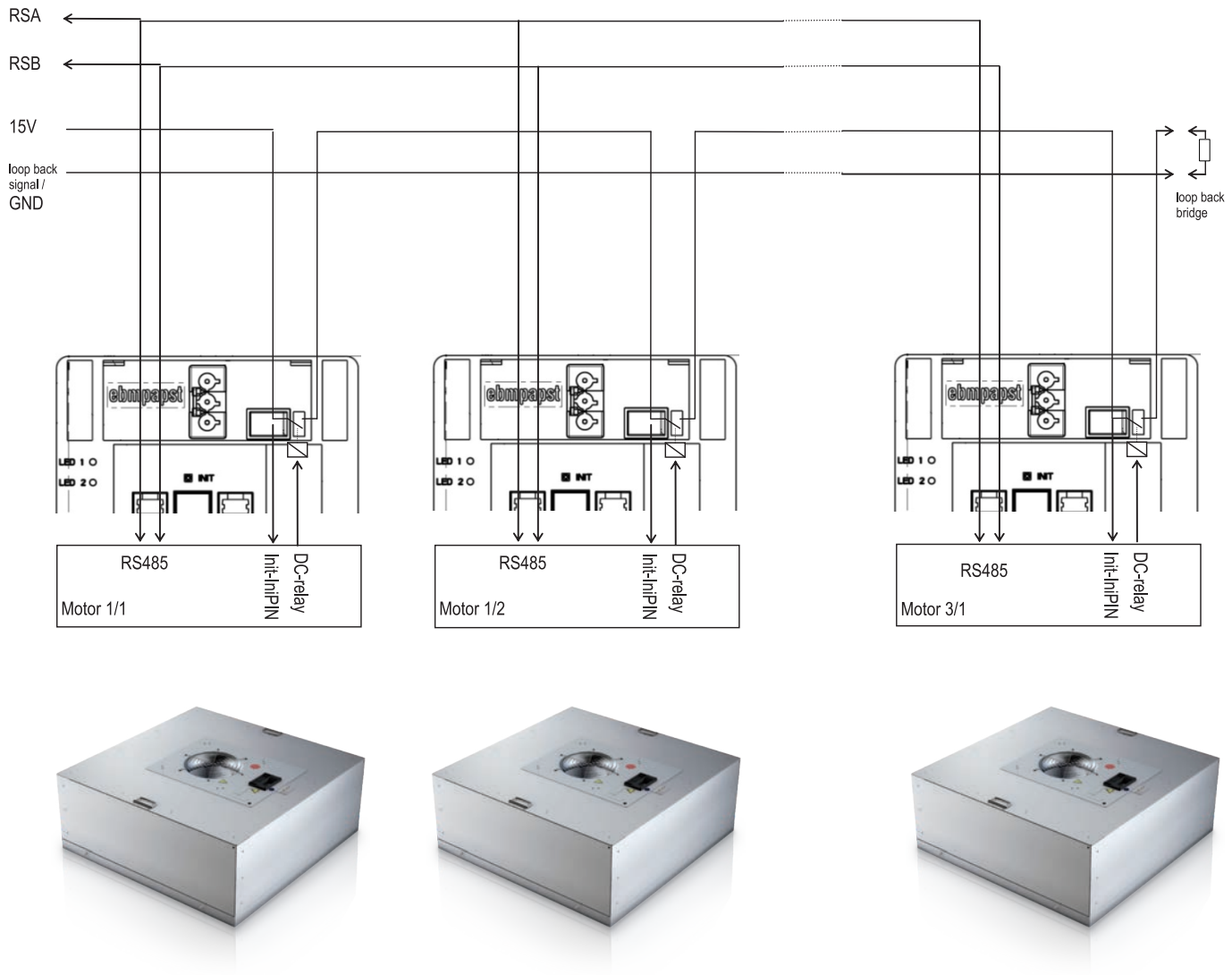
No.	Conn.	Designation	Color	Function/assignment
KL1	1	L	black	Supply connection, power supply 1~ 200–277 VAC, 50/60 Hz
KL1	2	N	blue	Power supply, 1~ 200–277 VAC, 50/60 Hz
KL1	3	PE	yellow/ green	Ground connection
KL2	1	RSA	-	Bus connection RS485, RSA, MODBUS RTU; SELV
KL2	2	RSB	-	Bus connection RS485, RSB, MODBUS RTU; SELV
KL2	3	GND	-	Reference ground for control interface; SELV
KL2	4	0–10V/PWM	-	Control input
KL2	5	+ 10 V	-	Fixed voltage output 10 VDC
KL2	6	RES	-	Reserve

No.	Conn.	Designation	Color	Function/assignment
KL2	7	COM	-	Alarm COM
KL2	8	NC	-	NC KL2 UMAX 24 V
KL2	9	Schirm	-	Shield
KL3	1	RSA	-	Bus connection RS485, RSA, MODBUS RTU; SELV
KL3	2	RSB	-	Bus connection RS485, RSB, MODBUS RTU; SELV
KL3	3	GND	-	Reference ground for interface; SELV
KL3	4	0–10 V	-	Control input
KL3	5	+ 10 V	-	Fixed voltage output 10 VDC
KL3	6	RES	-	Reserve
KL3	7	COM	-	Alarm COM
KL3	8	NC	-	NC* KL3 UMAX 24 V
KL3	9	Schirm	-	Shield

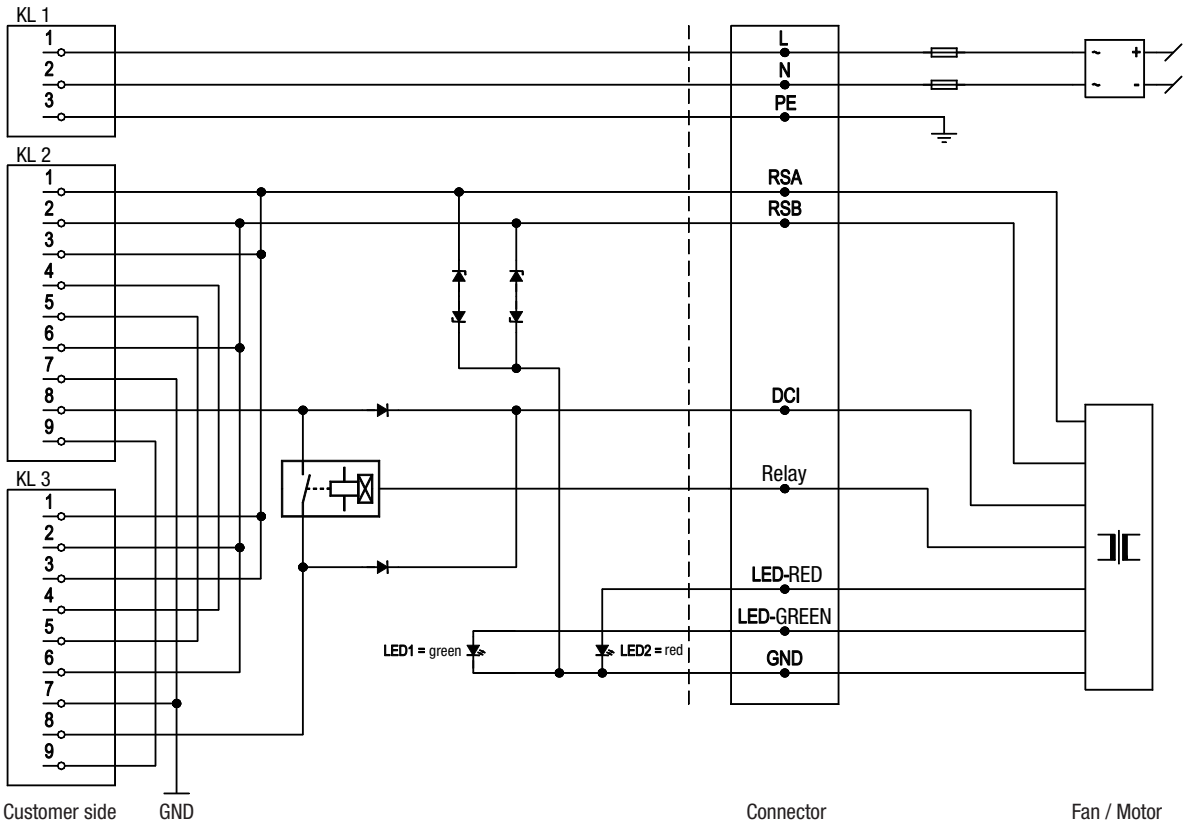
MODBUS RTU *with DCI function for auto-addressing.*

A master-slave-based BUS requires unique slave addresses. Our fans are delivered with a factory preset address, which is always the same (slave ID = 1). Therefore, the addresses have to be changed for networking. We refer to this as DCI addressing (Daisy chain interface). This process can be carried out automatically.

DCI addressing: This is how it works.
Fans with MODBUS/DCI interface can be addressed via a voltage signal of 15 V/24 VDC (Init pin at pin 8 of the RJ45 plug). Only the unit activated with the Init pin listens to messages sent to slave address 247 and accepts a new MODBUS address written by the master control to this 247 address. After a unit is successfully addressed, its DC relay is switched on and the 15 V/24 V Init pin is forwarded to the next fan module in the chain. This fan is now activated via the hardware signal (Init pin) and addressing continues as described above.



Diagram



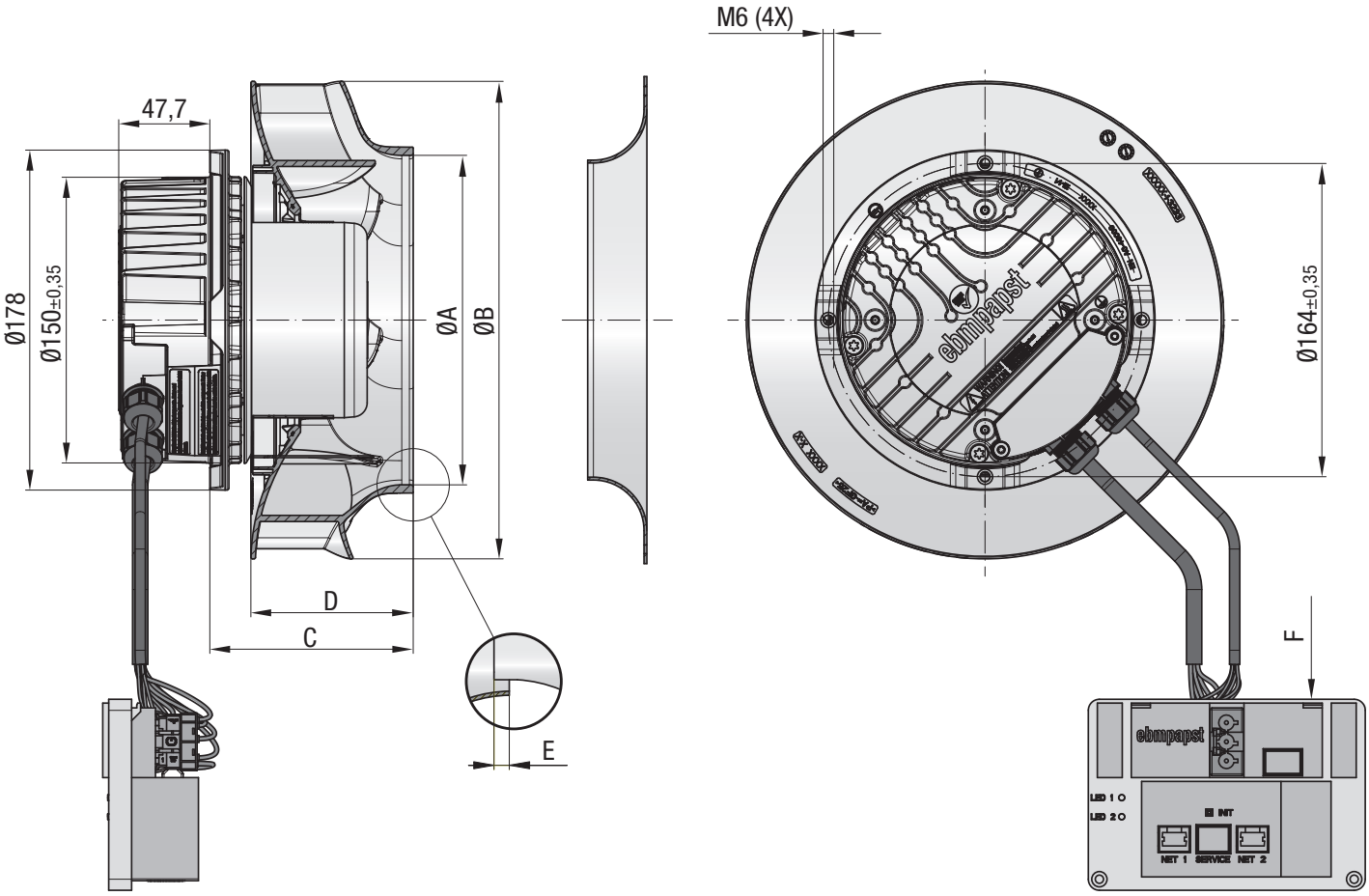
LED1 / LED2

Status	Priority	Address S/N	Speed	green LED	red LED
Malfunction	**1**	S/N any	any	off	flashing 1 Hz
Flashing	**2**	S/N =1/1	any	flashing 10 Hz	on
Flashing	**2**	S/N<> 1	any	flashing 10 Hz	off
after set value change	**3**	S/N=1/1	any	flashing three times at 2.5 Hz	on
after set value change	**3**	S/N <> 1	any	flashing three times at 2.5 Hz	off
Fan speed 0	**4**	S/N =1/1	n = 0	flashing 1 Hz	on
Fan speed 0	**4**	S/N <> 1	n = 0	flashing 1 Hz	off
Fan speed >0	**4**	S/N =1/1	n > 0	off	on
Fan speed >0	**4**	S/N<> 1	n > 0	off	off

Connection diagram

Nr.	Conn.	Designation	Function / assignment
KL1	**1**	L	Power supply, phase, 50/60 Hz
KL1	**2**	N	Power supply, neutral conductor, 50/60 Hz
KL1	**3**	PE	Protective earth
KL2 / KL3	**1**	RSA	RS485 interface for MODBUS-RTU, RSA
KL 2 / KL3	**2**	RSB	RS485 interface for MODBUS-RTU, RSB
KL2 / KL3	**3**	RSA	RS485 interface for MODBUS-RTU, RSA
KL2 / KL3	**4**	-	Bridge KL2-KL3
KL2 / KL3	**5**	-	Bridge KL2-KL3
KL2 / KL3	**6**	RSB	RS485 interface for MODBUS-RTU, RSB
KL2 / KL3	**7**	GND	Reference Ground
KL2 / KL3	**8**	DCI	Daisy chain signal
KL2 / KL3	**9**	Schirm	Shield for RJ45 CAT5 wire (not used)

R3G *with connector board/ MODBUS/0–10V control.*



Dimensions

Size	Item number	A	B	C	D	E	F*
250	**R3G250-RR01-H8**	172.5	250.0	106.5	85.0	2.0	1,000
310	**R3G310-BL06-G9**	222.0	360.0	163.5	146.2	6.0	700
	R3G310-RR05-H8	204.0	325.5	153.0	141.5	8.0	1,000
355	**R3G355-RR06-G8**	237.0	372.5	170.5	162.0	10.0	1,000
400	**R3G400-AH11-H8**	268.0	404.0	117.4	101.0	4.0	1,000
	R3G400-RS03-H8	266.0	420.0	194.0	182.0	10.0	1,000

Preliminary data. All dimensions in mm. Data sheets available on request.
Subject to technical changes.

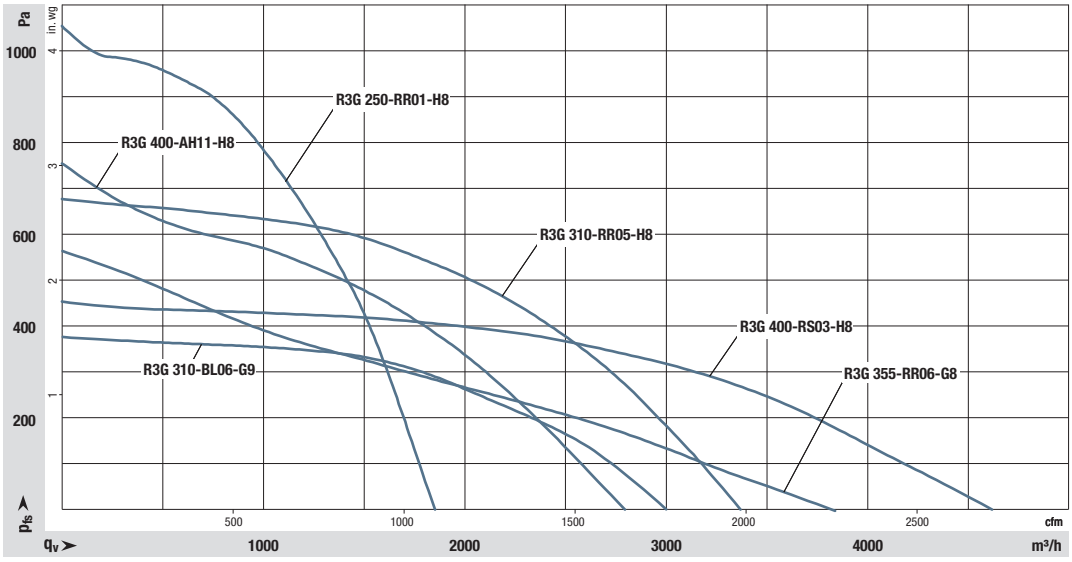
* free cable length

Selection table for R types

c [m/s] = Air velocity below filter	FFU sizes FFU 6 x 6	FFU 6 x 12	FFU 9 x 12	FFU 12 x 12
nominal 0.45 m/s	**R3G250/500 W** 1~200 to 277 V R3G250-RR01-H8 Inlet ring: 96359-2-4013	**R3G310/500 W** 1~200 to 277 V R3G310-RR05-H8 Inlet ring: 31000-2-4013	**R3G355/250 W** 1 ~200 to 277 V R3G355-RR06-G8 Inlet ring: 35500-2-4013	
		R3G400 x 50/500 W 1~200 to 277 V R3G400-AH11-H8 Inlet ring: 40905-2-2943	**R3G400/500 W** 1~200 to 277 V R3G400-RS03-H8 Inlet ring: 40905-2-2943	**R3G400/500 W** 1~200 to 277 V R3G400-RS03-H8 Inlet ring: 40905-2-2943
		R3G310 R63-D2 500 W 1~200 to 277 V R3G310-BL06-G9 Inlet ring: 31570-2-4013	**R3G310 R63-D2 500 W** 1 ~200 to 277 V R3G310-BL06-G9 Inlet ring: 31570-2-4013	

Subject to technical changes.

Air characteristic curves



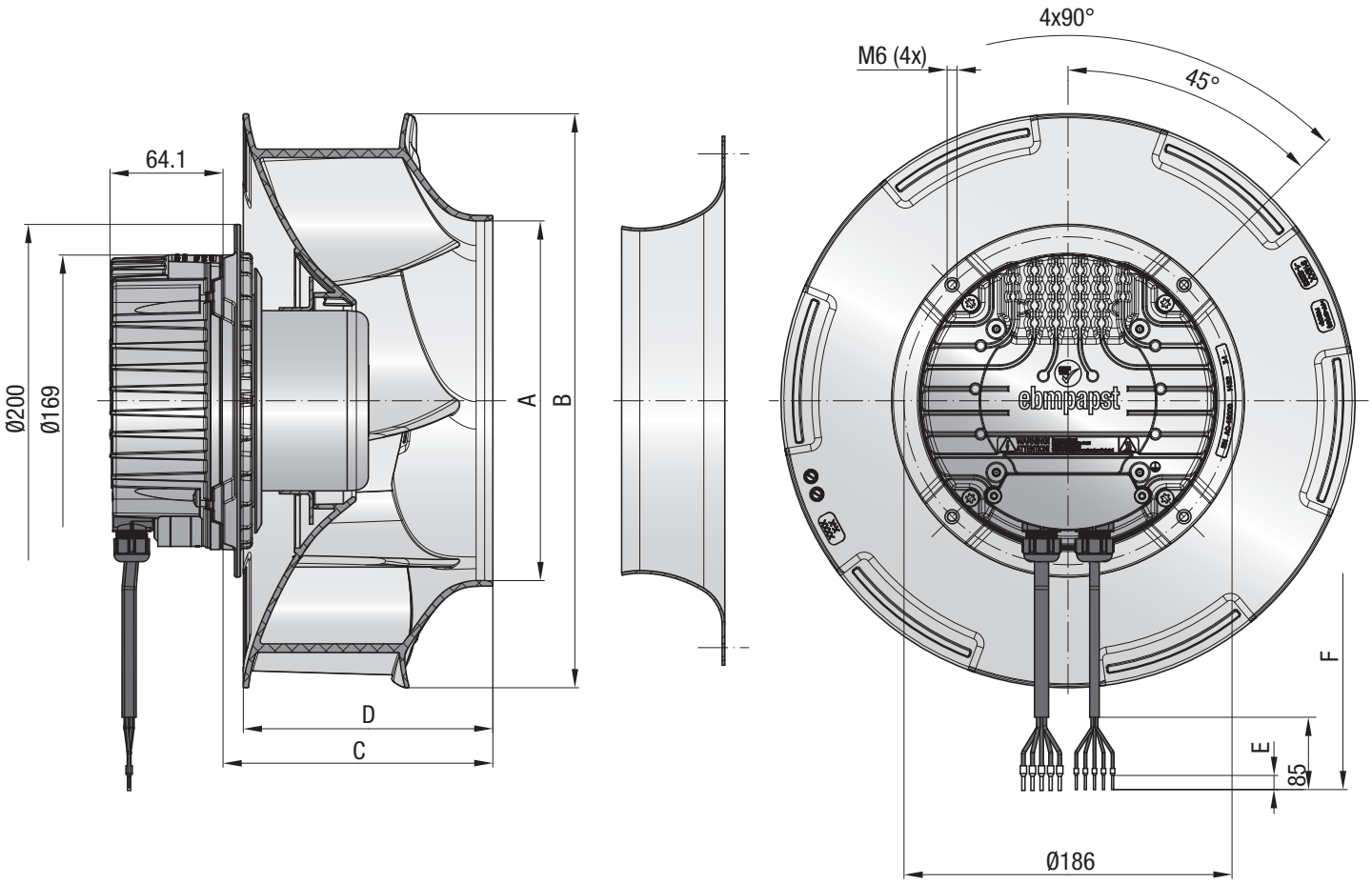
Nominal data

Size	Item number	Inlet ring*	Nominal voltage range	Frequency	Speed	Max. power consumption	Max. input current	Permissible ambient temperature
			V AC	Hz	rpm	W	A	°C
250	**R3G250-RR01-H8**	96359-2-4013	1~200 to 277	50/60	3,600	480	2.1	-25 to 60
310	**R3G310-BL06-G9**	31570-2-4013	1~200 to 277	50/60	1,650	250	1.1	-25 to 55
	R3G310-RR05-H8	31000-2-4013	1~200 to 277	50/60	2,250	500	2.2	-25 to 60
355	**R3G355-RR06-G8**	35500-2-4013	1~200 to 277	50/60	1,450	250	1.1	-25 to 60
400	**R3G400-AH11-H8**	54476-2-4013	1~200 to 277	50/60	1,750	380	1.7	-25 to 60
	R3G400-RS03-H8	54476-2-4013	1~200 to 277	50/60	1,450	500	2.2	-25 to 50

Preliminary data. All dimensions in mm. Data sheets available on request.
Subject to technical changes.

* not included in scope of delivery

R3G *without connector board/ MODBUS/0–10V control US TYPES.*



Dimensions

Size	Item number	A	B	C	D	E	F*
250	**R3G250-RR05-R8**	172.5	250.0	106.5	85.0	2.0	600
	R3G250-RR01-V1	172.5	250.0	106.5	85.0	2.0	600
310	**R3G310-RR08-R2**	204.0	325.5	153.0	141.5	8.0	600
	R3G310-RR05-H4	204.0	325.5	153.0	141.5	8.0	600
400	**R3G400-RR07-G8**	266.0	420.0	194.0	182.0	10.0	600
	R3G400-RS03-H4	266.0	420.0	194.0	182.0	10.0	600

Preliminary data. All dimensions in mm. Data sheets available on request.
Subject to technical changes.

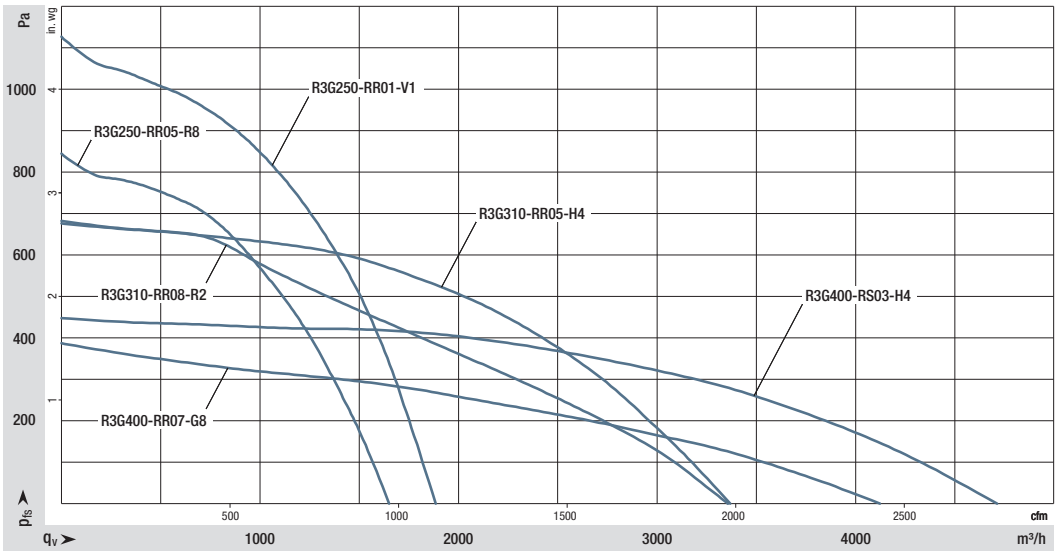
* not included in scope of delivery

Selection table for R types

c [m/s] = Air velocity below filter	FFU sizes			
	FFU 6 x 6	**FFU 6 x 12**	**FFU 9 x 12**	**FFU 12 x 12**
nominal 0.45 m/s	**R3G250/375 W** 1~100 to 130 V R3G250-RR05-R8 Inlet ring: 96359-2-4013	**R3G310/375 W** 1 ~100 to 130V R3G310-RR08-R2 Inlet ring: 31000-2-4013	**R3G400/250 W** 1~100 to 130 V R3G400-RR07-G8 Inlet ring: 54476-2-4013	**R3G400/250 W** 1~100 to 130 V R3G400-RR07-G8 Inlet ring: 54476-2-4013
	R3G250/500 W 1~200 to 277 V R3G250-RR01-V1 Inlet ring: 96359-2-4013	**R3G310/500 W** 1~200 to 277 V R3G310-RR05-H4 Inlet ring: 31000-2-4013	**R3G400/500 W** 1~200 to 277 V R3G400-RS03-H4 Inlet ring: 54476-2-4013	**R3G400/500 W** 1~200 to 277 V R3G400-RR07-G8 Inlet ring: 54476-2-4013

Subject to technical changes.

Air characteristic curves



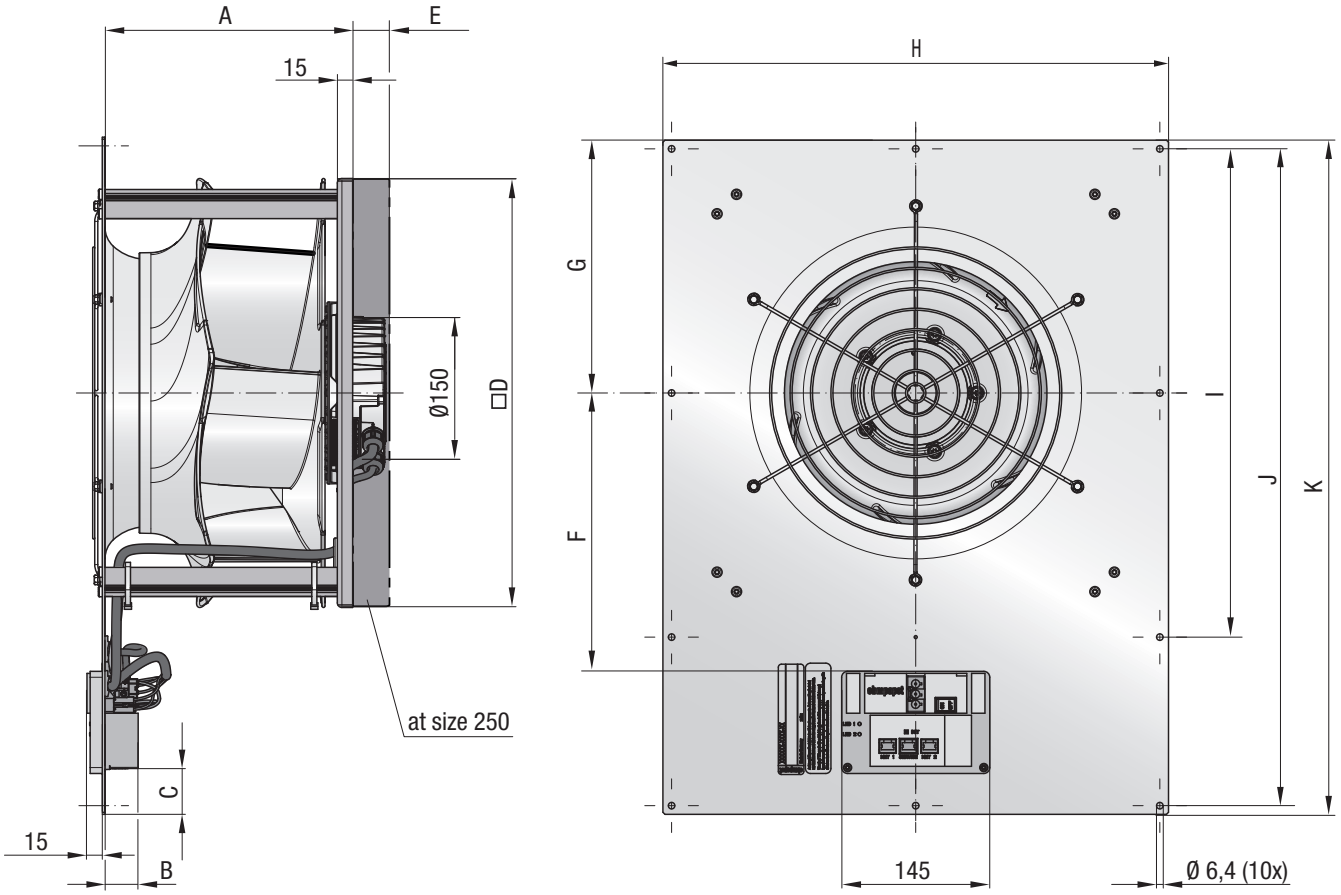
Nominal data

Size	Item number	Inlet ring*	Nominal voltage range	Frequency	Speed	Max. power consumption	Max. input current	Permissible ambient temperature
			V AC	Hz	rpm	W	A	°C
250	**R3G250-RR05-R8**	96359-2-4013	1~100 to 130	50/60	3,230	340	3.0	-25 to 40
	R3G250-RR01-V1	96359-2-4013	1~200 to 277	50/60	3,690	490	2.1	-25 to 40
310	**R3G310-RR08-R2**	31570-2-4013	1~100 to 130	50/60	2,100	375	3.2	-25 to 55
	R3G310-RR05-H4	31000-2-4013	1~200 to 277	50/60	2,250	500	2.2	-25 to 55
400	**R3G400-RR07-G8**	54476-2-4013	1~100 to 130	50/60	1,170	250	2.2	-25 to 55
	R3G400-RS03-H4	54476-2-4013	1~200 to 277	50/60	1,450	500	2.2	-25 to 50

Preliminary data. All dimensions in mm. Data sheets available on request.
Subject to technical changes.

* not included in scope of delivery

K boxes *with MODBUS/0–10V control system.*



Note:
The K box product range with MODBUS and 0–10 V control has UL approval in some cases.

UL certification means the following design:
– Impeller material is 5 VA according to UL94
– All-pole mains switch
– UL approval UL507/electric fans

Dimensions

Size		Item number	A	B	C	D	E	F	G	H	I	J	K
250	**K boxes/UL certification**	K3G250-RR05-R8	180.0	33.0	22.0	254.0	49.0	127.0	156.0	270.0	253.0	383.0	400.0
	K boxes/UL certification	K3G250-RR01-H1	180.0	33.0	22.0	254.0	49.0	127.0	156.0	270.0	253.0	383.0	400.0
	K boxes	K3G250-RR01-H8	180.0	33.0	22.0	254.0	49.0	127.0	156.0	270.0	253.0	383.0	400.0
310	**K boxes/UL certification**	K3G310-RR18-R8	213.0	33.0	45.0	350.0	33.0	272.5	247.5	495.0	478.0	643.0	660.0
	K boxes/UL certification	K3G310-RR05-H1	213.0	33.0	45.0	350.0	33.0	272.5	247.5	495.0	478.0	643.0	660.0
	K boxes	K3G310-RR05-H8	213.0	33.0	45.0	350.0	33.0	272.5	247.5	495.0	478.0	643.0	660.0
400	**K boxes/UL certification**	K3G400-AK11-H1	171.0	33.0	45.0	420.0	33.0	272.5	247.5	495.0	478.0	643.0	660.0
	K boxes	K3G400-AK11-H8	171.0	33.0	45.0	420.0	33.0	272.5	247.5	495.0	478.0	643.0	660.0
	K boxes/UL certification	K3G400-RS03-H1	242.5	33.0	45.0	420.0	33.0	272.5	247.5	495.0	478.0	643.0	660.0
	K boxes	K3G400-RS03-H8	242.5	33.0	45.0	420.0	33.0	272.5	247.5	495.0	478.0	643.0	660.0

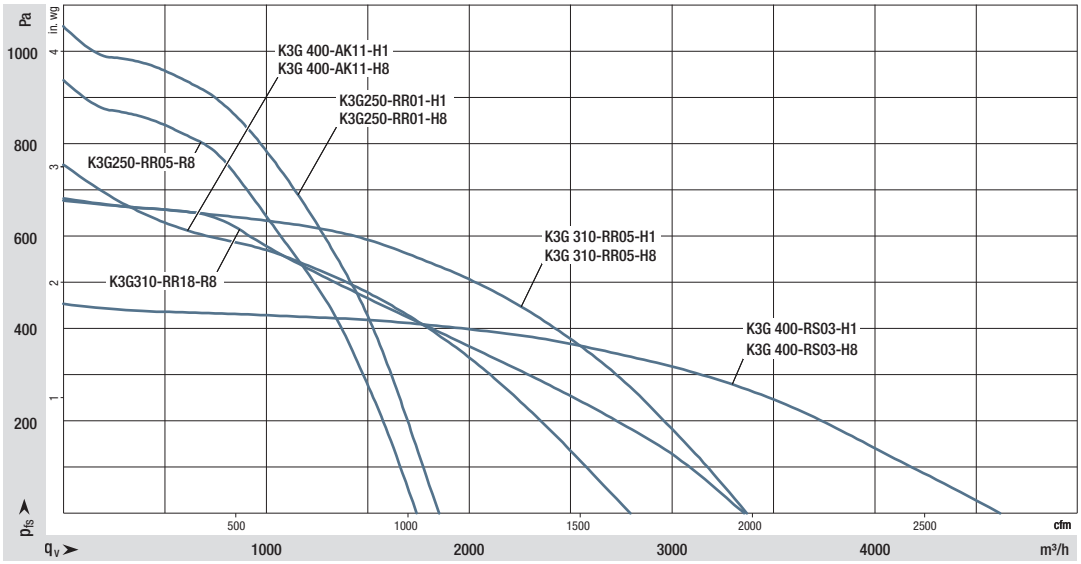
Preliminary data. All dimensions in mm. Data sheets available on request.
Subject to technical changes.

K box selection table

	FFU sizes			
c [m/s] = Air velocity below filter	**FFU 6 x 6**	**FFU 6 x 12**	**FFU 9 x 12**	**FFU 12 x 12**
nominal 0.45 m/s	**K3G250/375 W** 1~100 to 130 V K3G250-RR05-R8	**K3G310 / 375 W** 1~100 to 130 V K3G310-RR18-R8	**K3G400 / 375 W** 1~100 to 130 V K3G310-RR18-R8	
	K3G250/500 W 1~200 to 277 V K3G250-RR01-H8-/H1	**K3G310/500 W** 1~200 to 277 V K3G310-RR05-H8-/H1	**K3G400/500 W** 1~200 to 277 V K3G400-RS03-H8-/H1	**K3G400/500 W** 1~200 to 277 V K3G400-RS03-H8-/H1
		K3G400 x 50/500 W 1~200 to 277 V K3G400-AK11-H8-/H1		**K3G400/500 W** 1~200 to 277 V K3G400-RS03-H8-/H1

Subject to technical changes.

Air characteristic curves

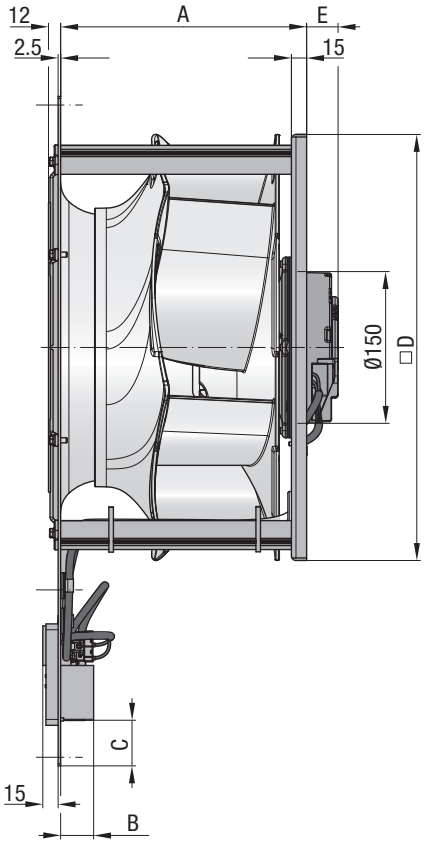


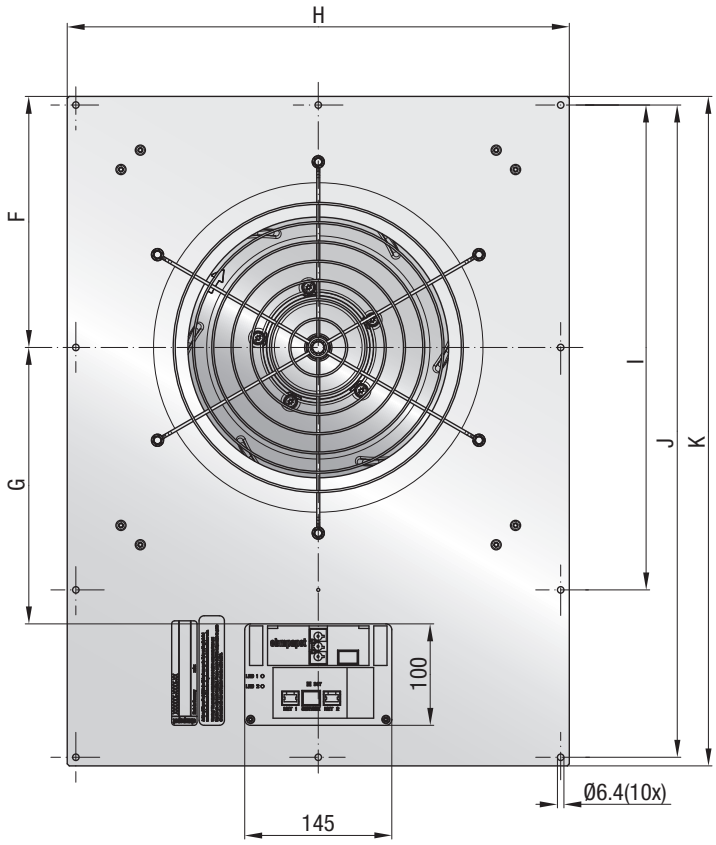
Nominal data

Size		Item number	Nominal voltage range	Frequency	Speed	Max. power consumption	Max. input current	Permissible ambient temperature
			V AC	Hz	rpm	W	A	°C
250	K boxes/UL certification	K3G250-RR05-R8	1~100 to 130	50/60	3,400	375	3.4	-25 to 60
	K boxes/UL certification	K3G250-RR01-H1	1~200 to 277	50/60	3,600	480	2.1	-25 to 60
	K boxes	K3G250-RR01-H8	1~200 to 277	50/60	3,600	480	2.1	-25 to 60
310	K boxes/UL certification	K3G310-RR18-R8	1~100 to 130	50/60	2,100	375	3.2	-25 to 60
	K boxes/UL certification	K3G310-RR05-H1	1~200 to 277	50/60	2,250	500	2.2	-25 to 55
	K boxes	K3G310-RR05-H8	1~200 to 277	50/60	2,250	500	2.2	-25 to 60
400	K boxes/UL certification	K3G400-AK11-H1	1~200 to 277	50/60	1,750	380	1.7	-25 to 60
	K boxes	K3G400-AK11-H8	1~200 to 277	50/60	1,750	380	1.7	-25 to 60
	K boxes/UL certification	K3G400-RS03-H1	1~200 to 277	50/60	1,450	500	2.2	-25 to 50
	K boxes	K3G400-RS03-H8	1~200 to 277	50/60	1,450	500	2.2	-25 to 50

Preliminary data. All dimensions in mm. Data sheets available on request.
Subject to technical changes.

K boxes *with MODBUS/DCI.*





Note:
The K box product range with MODBUS and 0–10 V control has UL approval in some cases.

UL certification means the following design:
– Impeller material is 5 VA according to UL94
– All-pole mains switch
– UL approval UL507/electric fans

Dimensions

Size		Item number	A	B	C	D	E	F	G	H	I	J	K
250*	K boxes/UL certification	K3G250-RO44-20	180.0	33.0	22.0	254.0	49.0	127.0	156.0	270.0	253.0	383.0	400.0
		K3G250-RO44-25	180.0	33.0	22.0	254.0	49.0	127.0	156.0	270.0	253.0	383.0	400.0
310	K boxes/UL certification	K3G310-RO38-20	213.0	33.0	45.0	350.0	31.0	273.0	248.0	495.0	478.0	643.0	660.0
		K3G310-RO38-25	213.0	33.0	45.0	350.0	31.0	273.0	248.0	495.0	478.0	643.0	660.0
400	K boxes/UL certification	K3G400-AH05-20	171.0	33.0	45.0	420.0	31.0	273.0	248.0	495.0	478.0	643.0	660.0
		K3G400-AH05-25	171.0	33.0	45.0	420.0	31.0	273.0	248.0	495.0	478.0	643.0	660.0
	K boxes/UL certification	K3G400-RP45-20	242.5	33.0	45.0	420.0	31.0	273.0	248.0	495.0	478.0	643.0	660.0
		K3G400-RP45-25	242.5	33.0	45.0	420.0	31.0	273.0	248.0	495.0	478.0	643.0	660.0

Preliminary data. All dimensions in mm. Data sheets available on request.
Subject to technical changes.

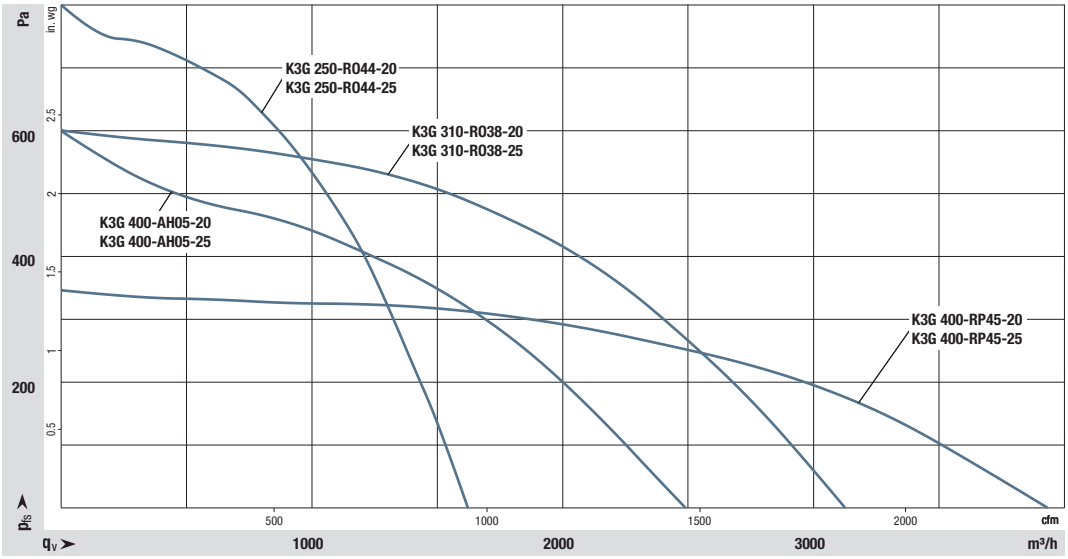
* for size 250, the motor is located in an enclosure

K box selection table

	FFU sizes			
c [m/s] = Air velocity below filter	**FFU 6 x 6**	**FFU 6 x 12**	**FFU 9 x 12**	**FFU 12 x 12**
nominal 0.45 m/s	**K3G250/400 W** 1~200 to 277 V K3G250-RO44-20-/25	**K3G310 / 400 W** 1~200 to 277 V K3G310-RO38-20-/25	**K3G400 / 400 W** 1~200 to 277 V K3G400-RP45-20-/25	**K3G400 / 400 W** 1~200 to 277 V K3G400-RP45-20-/25
	K3G250/400 W 1~200 to 277 V K3G250-RO44-20-/25	**K3G400 x 50 / 500 W** 1~200 to 277 V K3G400-AH05-20-/25	**K3G400 / 400 W** 1~200 to 277 V K3G400-RP45-20-/25	**K3G400 / 400 W** 1~200 to 277 V K3G400-RP45-20-/25

Subject to technical changes.

Air characteristic curves



Nominal data

Size		Item number	Nominal voltage range	Frequency	Speed	Max. power consumption	Max. input current	Permissible ambient temperature
			V AC	Hz	rpm	W	A	°C
250	K boxes/UL certification	**K3G250-RO44-20**	1~200 to 277	50/60	3,100	310	1.35	-25 to 40
		K3G250-RO44-25	1~200 to 277	50/60	3,100	310	1.35	-25 to 40
310	K boxes/UL certification	**K3G310-RO38-20**	1~200 to 277	50/60	2,100	400	2.0 (200 V)	-25 to 40
		K3G310-RO38-25	1~200 to 277	50/60	2,100	410	1.8	-25 to 40
400	K boxes/UL certification	**K3G400-AH05-20**	1~200 to 277	50/60	1,550	275	1.4–1.0	0 to 40
		K3G400-AH05-25	1~200 to 277	50/60	1,550	275	1.2	-25 to 40
	K boxes/UL certification	**K3G400-RP45-20**	1~200 to 277	50/60	1,250	340	1.7	-25 to 40
		K3G400-RP45-25	1~200 to 277	50/60	1,250	320	1.4	-25 to 40

Preliminary data. All dimensions in mm. Data sheets available on request.
Subject to technical changes.

EC-Control: *The powerful control software.*

EC systems safely under control.
EC-Control enables ebmBUS and MODBUS RTU fan networks to be easily controlled and monitored. For this purpose, the software can be configured for USB and for serial and Ethernet interface converters. The multi-language and intuitive user interface is based on the usual Windows® system environment. Therefore, thousands of fans can be positioned easily and clearly on the floor plans, meaning that entire networks are always clear to see.

The software supports the maximum number of devices enabled by the BUS system concerned (up to 7,905 fans with ebmBUS and 247 with MODBUS RTU). However, this can be extended using additional subnet addressing. This means that each ventilator address can not just be used once per system, but once per interface converter. Up to 10 interface converters are supported. The configuration assistant enables both the different interface converters and the system to be configured quickly and easily.

All fan parameters can be easily determined in the fan setup dialog. There are comprehensive, self-explanatory headings for this purpose.

The variable EC-Control user interface only displays the entries relevant for the system concerned. Other functions include support for a second monitor, a tree-shaped administration structure for finding individual fans in comprehensive systems, and online help.

Overview of functions:
- Setting more than 40 fan parameters, e.g. mode of operation, set values and control parameters
- Energy-saving timer for night-time setback
- Changing the fan address (also using MODBUS 5.0 auto-addressing)
- Reading out fan parameters such as the actual speed, serial number and date of manufacture
- Reading out error status and error memory
- Saving various configurations as exportable and editable profile
- Monitoring systems, including an option to report failures by e-mail
- Managing multiple systems within one program installation
- Supporting Ethernet/RS485 interface converters as well as USB/RS485 and Bluetooth/RS485
- Simultaneously monitoring ebmBUS and MODBUS RTU-based system components (requires multiple interface converters)
- Outputting status messages via the USB relay box (Item no. 10450-1-0174) with the option of triggering an external action, e.g. signal lamp
- Monitoring up to 10 x 247 fans with MODBUS RTU systems and 10 x 7,905 fans with ebmBUS systems
- Extended export and import of attachments in CSV format with all relevant information, including exchange between operating systems with different language versions

Processes various status messages: the USB relay box (item no. 10450-1-0174).

System version: EC-Control 3.20

Item no.: 25717-2-0199

Scope of delivery: USB stick with
- software in 13 languages: DE, EN, ES, FR, IT, NL, FI, PT-BR, JA, ZH (simplified/traditional), RU, SWE
- Operating instructions in four languages: DE, EN, JA, FR
- Application manual in five languages: DE, EN, JA, FR, RU
- Quick video guides

System requirements:
- Windows 7 SP1, Windows 8.1 or Windows 10
- Approx. 60 MB available capacity on hard disk; extra space is required for the driver if using the USB relay box
- Monitor with a resolution of at least 1024 x 768 pixels and 16-bit color depth
- At least one RS485 interface converter e.g. USB (Item no. 21510-1-0174)

EC-Clone: *the efficient copying program and analysis tool.*

Ready to use for Windows.
EC-Clone allows small-series fans to be efficiently parameterized with a customer-specific configuration. After reading out the configuration from the fan or from a file, the read out or saved configuration is transferred to other fans. If necessary, the device address of the target fan can be adjusted here. EC-Clone also identifies fans with an unknown fan address.

EC-Clone also enables the data of complete systems to be stored and transferred to ebm-papst. This makes it easier to find and resolve errors.

The software's design allows it to be used with a touch screen, making it even more convenient. This means that there is no need for a mouse or keyboard at the workstation.

Program version: EC-Clone 3.0

Item no.: 25718-2-0199

Scope of delivery: USB stick with
– Manual as a PDF in three languages: DE, EN, RU
– Installation program
– Quick video guide
– Driver for USB interface converter

System requirements:
– Windows 7 SP1, Windows 8.1 or Windows 10
– Approx. 20 MB free storage space on the hard disk
– Monitor with a resolution of at least 1024 x 768 pixels
– At least one RS485 interface converter e.g. USB (Item no. 21510-1-0174)

Language: EN

RS485 USB adapter: *its gateway to the BUS world.*

It always fits.
Whether a fan or motor, the ebm-papst USB RS485 adapter connects every RS485 interface to the PC. The adapter can be used with ebm-papst EC-Control or EC-Clone software. In this case, the USB drivers required to operate the adapter are part of the software package.

Nominal data

Type		21510-1-0174
Power supply	**VDC**	5 (via USB)
Electricity supply	**mA**	100 (via USB)
Dimensions	**mm**	66 x 23 14

Operating mode	RS485, two-wire operation without echo, internal termination with terminating resistor (pre-configured)
RS485 connection	D+ (RSA), D- (RSB), D1/D0, GND (COM) Max. cable length 1,200 m (at 9,600 bits/s), 1,000 m (at 19,200 bits/s)
Data rate	500 kbit/s
Insulation	2,500 V (overvoltage protection)
Status display	Via LED Green: Send TxD Red: Receive RxD
Housing	Plastic housing
Degree of protection	IP 10
Scope of delivery	Adapter with USB port Screw terminal

RS485 repeater *as a signal amplifier for its BUS connection.*

It all makes sense.
The RS485 repeater connects two RS485 bus segments (BUS-1, BUS-2). It can split a segment with excessively long BUS cables or too many nodes into two smaller, standardized units. A green LED indicates that the power supply is applied. It lights up red as soon as a data packet is transferred from the "BUS-2" channel to the "BUS-1 channel".

The repeater contains a terminating resistor for both channels, which can be connected in each case via DIP switches. The RS485 repeater is also equipped with RJ45 sockets for BUS connection. The RJ45 connector coding can be switched between ebmBUS (RSA and RSB on pins 6 and 5) and MODBUS (RSA and RSB on pins 1 and 2). Last but not least, there is an input that can be used to initiate DCI addressing on the BUS-2 side.

BUS	
Transceiver	ANSI/TIA/EIA-485, max. 100 kbps, 1/8 unit load, max. 100 kbps
General electrical data	
Operating voltage	200–277 VAC 50/60 Hz
Power consumption	< 3 VA (230 V)
Insulation (test voltage)	
Mains to bus connections	3750 VAC
BUS-1 to BUS-2	500 VAC
Function-specific data	
Terminating resistor	120 Ω, (can be connected)
Polarizing filter	Can be activated for BUS-2
Direction locking	In the initial state, both RS-485 channels are set to receive. If a signal occurs on one channel, the other channel is set to Send for a certain period and locked for reception. The locking duration after receiving a logical signal edge from "High" to "Low" is typically around 1.25 ms (minimum 1.07 ms, maximum 1.48 ms).
Housing	
Type	Sheet steel with galvanically treated surface, approx. 1 mm thick
Length x width x height [mm]	200 x 50 x 38
Weight	< 300 g
Assembly	Wall mounting using screws; alternatively cable ties can be used
Ambient conditions	
Operating temperature	0 to 50 °C
Storage temperature	- 20 to + 70 °C
Relative humidity	0 to 95 %, without condensation
Degree of protection	IP20
Further options	
Approvals	UL approval on request

RS485 cable replacement:
Wireless access.

Our fans, which communicate serially via MODBUS, can be connected to a wireless network with the Anybus Wireless Bolt. The Bolt enables wireless transmission via Bluetooth® or WLAN. It converts serial RS485 data into TCP/IP communication via the wireless connection. The Bolt can be used as a serial bridge or can also translate MODBUS TCP messages to MODBUS RTU devices. enabling transparent access to all existing serial MODBUS devices.

Cable replacement: wireless solution as a cable replacement for serial point-to-point connections

Access Point: TCP RTU transparent transformer

Serial interface	RS232/RS485: also supports MODBUS RTU and transparent routing from MODBUS TCP to MODBUS RTU
Ethernet interface	10/100BASE-T with automatic MDI/MDIX auto cross-over detection. Only for configuration.
WLAN interface	IEEE 802.11 a, b, g, n, d. – Access Point or Client, 2.4 GHz and 5 Ghz, 18dBm EIRP, 20 Mbit/s. Link speed: max 65 Mbit/s (802.11n SISO), EP 64/128, WPA, WPA-PSK and WPA2, TKIP and AES/CCMP, LEAP, PEAP including MS-CHAP.
Bluetooth interface	PANU & NAP – Access Point or Client, 14 dBm EIRP, ~1 Mbit/s, Classic Bluetooth v2.1, Authentication & Authorization, Encryption & Data Protection,Privacy & Confidentiality, NIST Compliant, FIPS Approved
Voltage	9–30 VDC (-5 % +20 %), Cranking 12V (ISO 7637-2:2011 pulse 4)
Power consumption	0.7 W idle, 1.7 W max
Dimensions	Diameter: 68 mm Height: 75 mm
Weight	81 g
Degree of protection	IP66 and IP67 for hood (outside the host), IP21 for base (within the host), UL NEMA 4X
Max. wireless range	100 m
Antenna	An integrated antenna
Connection	Includes connector (2x9p; 3.5 mm, Phoenix DFMC 1.5/9-ST-3.5, push-in spring connection)

MODBUS Display & Control
with auto-addressing.

Checks made easy!
The "MODBUS Display & Control", or MDC for short, not only displays its own operating state but also the connected fans' operating states. It is operated and parameterized using its keyboard. The device also has two RS485 interfaces.

While the RS485 MODBUS master interface communicates with fans compatible with ebm-papst MODBUS, the slave RS485 establishes a connection with a higher-level external system, such as the building management system (BMS).

MODBUS Display & Control

Item number		CCC000AH0101 (CN1116)
Permitted ambient temperature	°C	-20 to 60
Power supply (nominal)	VDC	10–24 V
Max. humidity	% RH	90
Width	mm	123
Length	mm	132
Height	mm	27
Weight	g	204

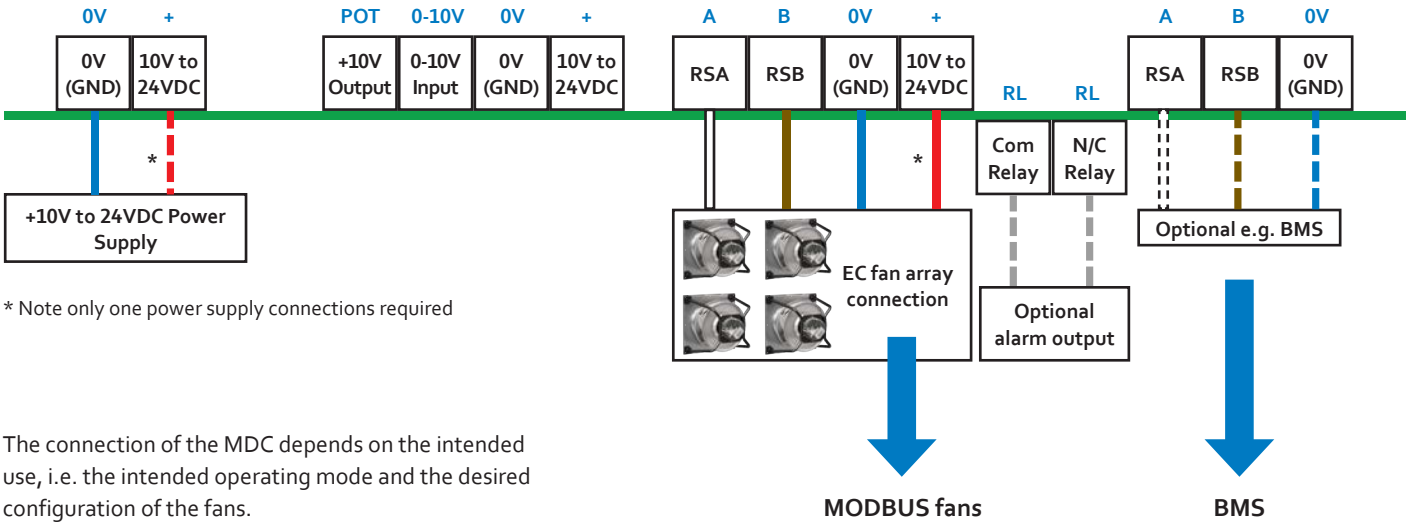
The MDC provides auto-addressing for easy installation and commissioning, and supports four different operating modes:

Monitor mode
Displays MODBUS data from fans, such as speed, power, motor temperature, temperature of the electronics, set value in percent, operating hours and warnings.

Monitor and Control mode
Displays the same as Monitor mode plus 0–100 % fan speed control with one or a combination of the following:
- 0–10 V control signal input
- BMS system connected to the RS485 slave
- MDC keyboard

Constant Volume/Constant Pressure Control mode
Displays the same as Monitor mode, but requires an external 0–10 V differential pressure sensor to maintain a constant volume or constant pressure. The set value is specified using the keyboard or via the RS485 slave port.

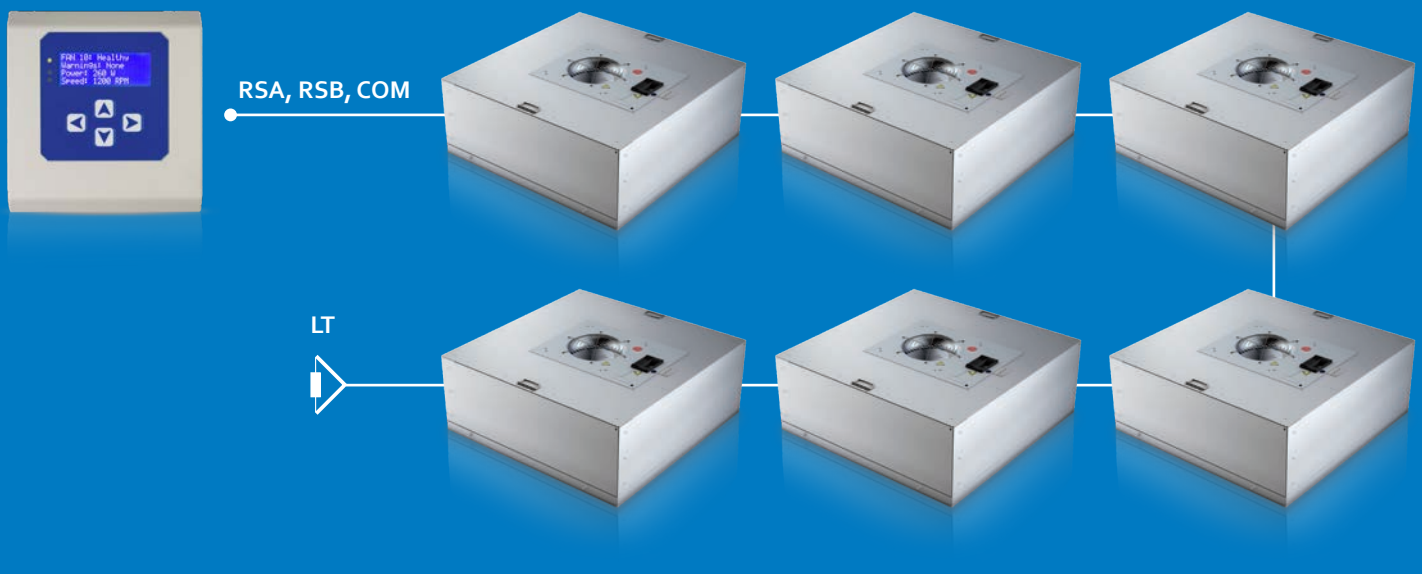
MODBUS Relay mode
Here, the MDC becomes a pure messenger between the fans and a BMS system. This enables direct access to all MODBUS registers on all connected fans.



* Note only one power supply connections required

The connection of the MDC depends on the intended use, i.e. the intended operating mode and the desired configuration of the fans.

Only with "MODBUS Display & Control" is the group connection of the filter-fan-units complete and you have full control.



Potentiometer 0–10 V
for cleanroom fans.

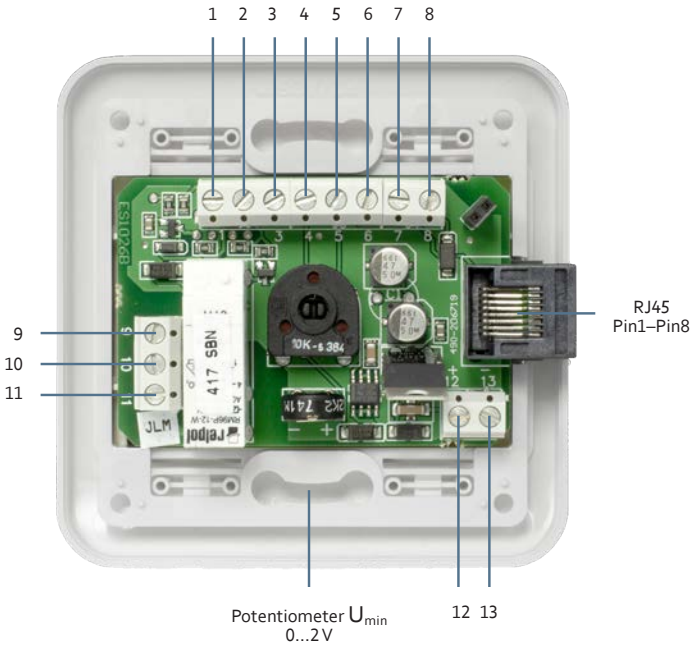
One potentiometer for all.
The potentiometer in the housing enables group control of ebmpapst fans with a 0–10 V interface. The fans are connected together via network cables and connected to the RJ45 connection on the 0–10 V potentiometer. All fans are connected in parallel and receive the same 0–10 V signal for the speed specification. The 0–10 V control signal is set between U_{min} and 10 V using the built-in rotary knob. The offset U_{min} can be varied between 0-2 V using a second potentiometer on the inside of the housing (U_{min} = 0 V is preset).

The status of the fan group is indicated by the two LEDs integrated into the housing. When the green "OK" lights up, everything is running according to plan. By contrast, the red "ERR" signals that at least one fan in the group is faulty and has interrupted the error signal circuit. For the group fault signal, there must be a bridge between Pin7 and Pin8 of the last RJ45 socket on the last fan of the chain. The error message can be sent externally to a DDC using a separate alarm contact (volt-free changeover contact).

Item no. *CLC000-AF05-01*

Connection

Designation	Signal
Terminal 1/RJ45-pin1	BUS connection MODBUS RS A
Terminal 2/RJ45-pin2	BUS connection MODBUS RS B
Terminal 3/RJ45-pin3	Electronics GND
Terminal 4/RJ45-pin4	0–10V output
Terminal 5/RJ45-pin5	10 V power supply
Terminal 6/RJ45-pin6	N.C.
Terminal 7/RJ45-pin7	Alarm 1 (GND for JP1 bridged)
Terminal 8/RJ45-pin8	Alarm 2
Terminal 9	ERR relay "make for failure"
Terminal 10	Common ERR relay
Terminal 11	ERR relay "break for failure"
Terminal 12	External power supply ~/+
Terminal 13	External power supply ~/-



Strong *partnerships.*

Approved controller – the symbol of connectivity.
Increasing market requirements have led us to exploit the wide range of options offered by fully controllable EC fans using third-party products. Fans equipped with MODBUS form the basis for combining EC motor and external control technology.

In order to provide our customers with the necessary assurance when selecting components, we only have partnerships with selected manufacturers. We also thoroughly test our GreenIntelligence EC fans combined with their control technology. We only give them an "Approved controller" label if we are fully satisfied that everything works.

Providing clean area hand in hand with well-known manufacturers.

vbk technology

vbk-technology – our partner for monitoring, controlling and parameterizing FFU systems.

Products:
- vbk.cmd hand-held control element (page 30)
- vbk.net mini control point for FFU (page 31)

WACHENDORFF
Prozesstechnik GmbH & Co. KG

Wachendorff Prozesstechnik – our partner for intelligent communication and process technology.

Products:
- cMT G series – FFU gateway (page 32)

AirCare Automation

AirCare Automation – our partner for controlling cleanroom environments.

Products:
- ACF200/ACF300: User-configurable controllers (page 34)
- ACC7: PLC-based controller for cleanroom environments (page 34)
- ACC8: HMI panel for monitoring FFUs in cleanrooms (page 35)

Accessories: vbk technology
hand-held control element and mini control station.

The vbk.x series of devices from vbk technology is used for monitoring, controlling and parameterizing EC fans with ebmBus or MODBUS interfaces and is perfectly suited for use in cleanrooms.

vbk.cmd hand-held control element
The modern hand-held vbk.cmd device is used to control and parameterize FFUs with EC fans that have ebmBUS or MODBUS interfaces.

The device is ideal for cleanroom service purposes, even in sensitive areas where laptops are taboo. It can be used in networks of several EC drives with full functional scope. For ease of use, a reduced basic data set with a limited range of functions is also provided. The "Scan network" function and monitor display for the connected units is an ideal operator access point.

General information
- Simple, clear menu navigation
- Dual language (German/English)
- Full graphic display with lighting
- Lightweight housing design that is easy to handle, yet is compact and robust
- High-performance Li-ion battery for up to 8 h operating time in cleanrooms

Hardware
- Li-ion battery; 3.7 V – 2300 mAh
- USB data interface with charging function
- Modern operating concept using rotary knob/pushbutton
- Real-time clock
- Fieldbus interface RS485
- Baud rates: up to 115200 bd
- Parities: none, straight, uneven
- Stop bits: 1, 2
- Data bits: 8, 9

vbk.net mini control station
The high-quality mini control station vbk.net is ideal for monitoring, controlling and regulating FFUs with EC fans that have ebmBUS or MODBUS interfaces.

The device enables up to 200 FFUs to be controlled on 2 lines in 10 FFU control groups or 2 control circuits.

The "Scan network" function with subsequent automatic installation of all participants automatically adjusts the set value storage to the selected operating mode (open-loop control/closed-loop control). Commissioning is made easy thanks to a semi-automatic aid for FFU addressing from the factory settings.

General information
- Simple, clear menu navigation
- Dual language (German/English)
- Full graphic display with lighting
- IP65 wall-mounted unit and IP20 built-in cabinet device with identical functionality
- Addressing aid from factory settings
- Automatic adaptation of set value storage

Hardware
- 24 V/100 mA
- Fieldbus RS485 – up to 200 FFUs on 2 lines ebmBUS and/or MODBUS (to be separated by lines)
- Three digital inputs (1x day/adjustment switching, 2x enable controller)
- Two digital outputs (error, unacknowledged errors)
- Two analog inputs (two sensor inputs for internal control and external set value requirements)
- USB data interface for saving parameter settings and for firmware updates

Accessory: Wachendorff Prozesstechnik
cMT G series – IIoT Edge gateway.

The cMT G series, which specializes in communication and data processing, contains 300 communication drivers and communicates this data to IIoT platforms using the most common IIoT protocols: OPC UA, MQTT and MODBUS TCP/IP.

Synchronization of data and event logs is supported with MySQL, MS SQL database servers.

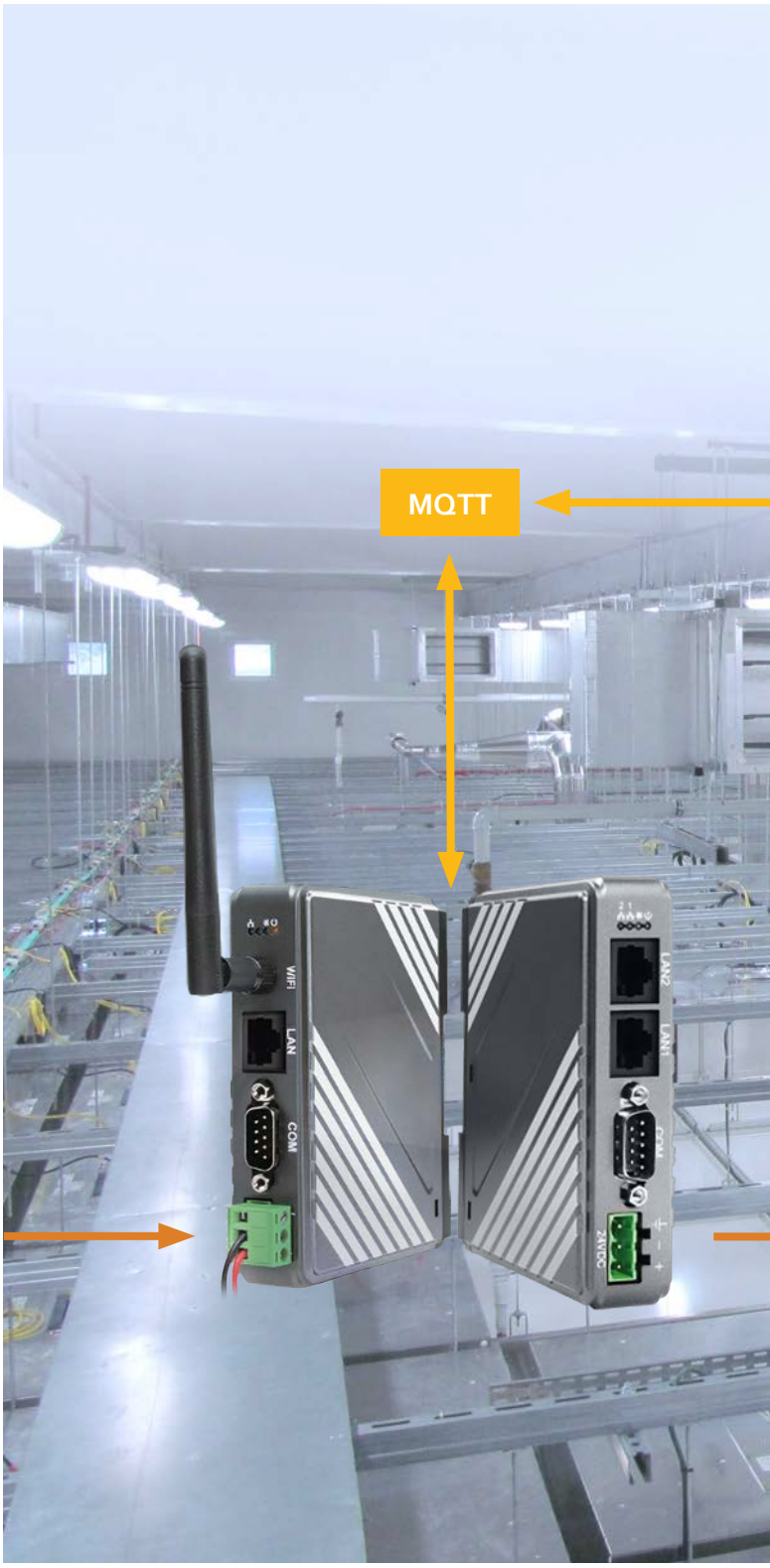
The integrated web interface allows a web browser to be used for tasks such as system setting, setting PLC communication parameters, data and event protocol view, etc.

The compact design and 35 mm top-hat DIN rail design make the model easy to use in a variety of environments. The cMT-G01 IIoT gateway is equipped with two Ethernet interfaces and three COM ports. The cMT-G02 is characterized by an Ethernet interface and a WiFi interface as per 802.11 b/g/n.

There are three different configurations available, for MODBUS/TCP, MQTT or OPC UA, meaning that the IIoT gateway can be set up easily. These projects enable direct integration of ebm-papst fans with MODBUS RTU interface.

cMT-G01:
LAN 1: 10/100/1000 base-T x 1
LAN 2: 10/100 base-T x 1
COM 1: RS-232 2 W
COM 2: RS-485 2 W/4 W
COM 3: RS-485 2 W

cMT-G02:
10/100 base-T x 1
IEEE 802.11 b/g/n
COM 1: RS-232 2 W
COM 2: RS-485 2 W/4 W
COM 3: RS-485 2 W




Alibaba Cloud
Microsoft Azure
IBM Bluemix
amazon web services
OPC UA

Accessory: AirCare
Controller and HMI panel.

ACF200/300 – controller configurable by user.

- 3.5" color touch screen
- Max. 250 FFUs and 8 groups/areas
- System, group and individual FFU control system
- FFU operating modes: on, standby, off, offline
- Timer
- Six discrete input and output I/Os
- Two analog inputs for pressure, temperature, humidity or air flow sensors (ACF300 only)
- Ethernet interface (ACF300 only) for:
  - Remote control from PC or mobile phone
  - Remote access to recorded sensor data
  - BMS interface via MODBUS TCP

ACC7 – PLC-based controller for controlling cleanroom environments.

- 7" and 12" color touch screens with customer-specific graphics
- Monitoring via configuration, group, subgroup and individual nodes (FFUs, sensors and actuators)
- Interlocked door control
- Room environmental monitoring
- Automatic pressure and temperature control
- BMS integration via MODBUS TCP
- Remote control and monitoring

ACC8 – HMI panel for monitoring FFUs in cleanrooms

- 7"–21" color touch, flat screens
- High-quality, customer-specific graphics
- Medium to large cleanroom installations
- Standard system integration interfaces:
  - BACnet/IP
  - MODBUS/TCP
  - IIoT protocols (MQTT and OPC UA)

Together, we ensure *clean air.*

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